

IDENTIFICATION OF TYLENCHULUS SPECIES FROM FLORIDA.

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The genus Tylenchulus Cobb, 1913 contains four species: T. semipenetrans Cobb, 1913 (1) that is a parasite of citrus (Citrus sp.) worldwide; T. furcus Van Den Berg and Spaull, 1982 that attacks sugarcane (Saccharum officinarum L.) in South Africa and does not occur in Florida (6); and two new species, T. graminis Inserra et al., 1988 and T. palustris Inserra et al., 1988, which were described recently from broomsedge (Andropogon virginicus L.) and pop ash (Fraxinus caroliniana Mill.), respectively, from Florida (3). T. graminis and T. palustris were previously considered 'wild' races of T. semipenetrans (4) and were subject to the same regulatory rules as T. semipenetrans in Florida. Defining the two new species had beneficial economic effects to the citrus industry of Florida, because land infested with the two new species can now meet citrus nursery site approval requirements. The purpose of this circular is to differentiate the three Tylenchulus species occurring in Florida. T. furcus differs from the three Florida species in having second-stage juveniles (J2) with a furcate tail.

Mature adult females of Tylenchulus have an anterior body portion that is more or less elongate and is permanently embedded in root tissues, whereas the posterior portion of the body is swollen and varies in shape in the different species. The swollen body portion protrudes from the root surface (Fig. 1).

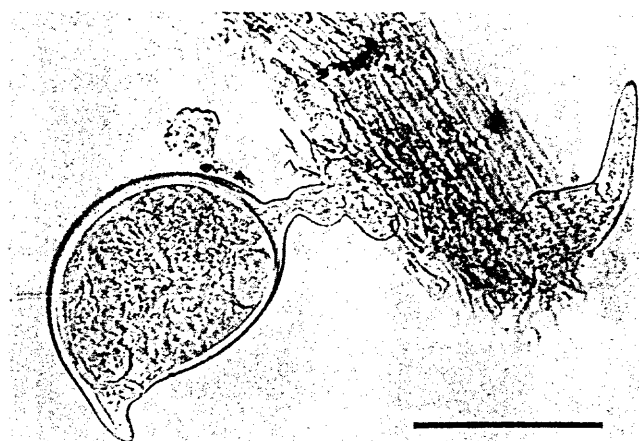


Fig. 1. A root segment infected with Tylenchulus sp. mature female. The elongate anterior portion of the nematode body is permanently embedded in root cortex and visible here because root tissues have been removed artificially. Note the swollen posterior portion of the body which always protrudes from the root surface. Scale bar = 85 μ m.

Adult males are vermiform. The excretory pore in all the juvenile and adult stages is located posteriorly (>50% of the body length). Because important diagnostic characters of mature adult females are located in the section of the posterior body portion, a diagram of this section is illustrated in Fig. 2. All the measurements reported in this circular are in μ m and were taken on live specimens unless otherwise indicated.

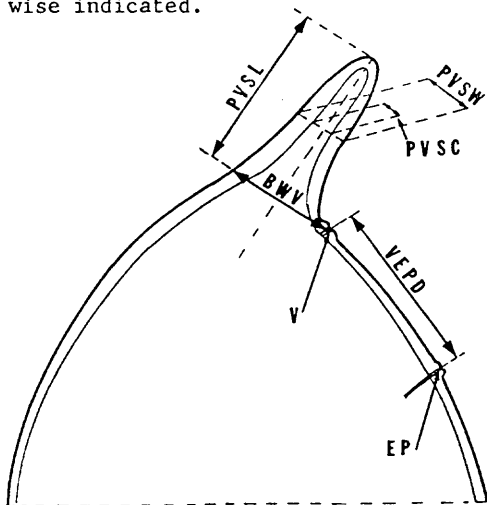


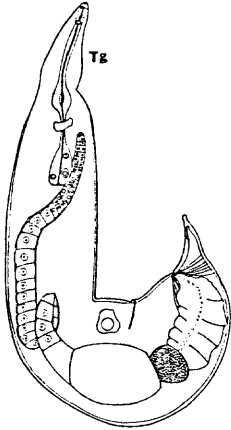
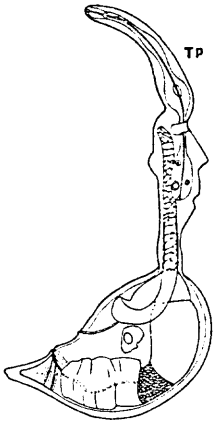
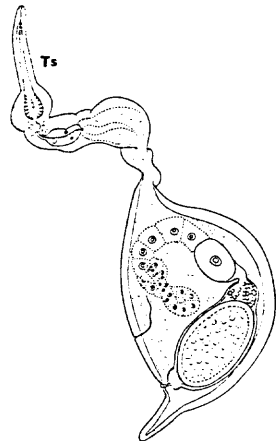
Fig. 2. Posterior body portion of a tylenchulid adult female showing morphological parameters of postvulval section. BWV = body width at vulva. EP = excretory pore. PVSC = postvulval section cavity of body. PVSL = postvulval section length of body. PVSW = postvulval section width of body. V = vulva. VEPD = vulva excretory pore distance.

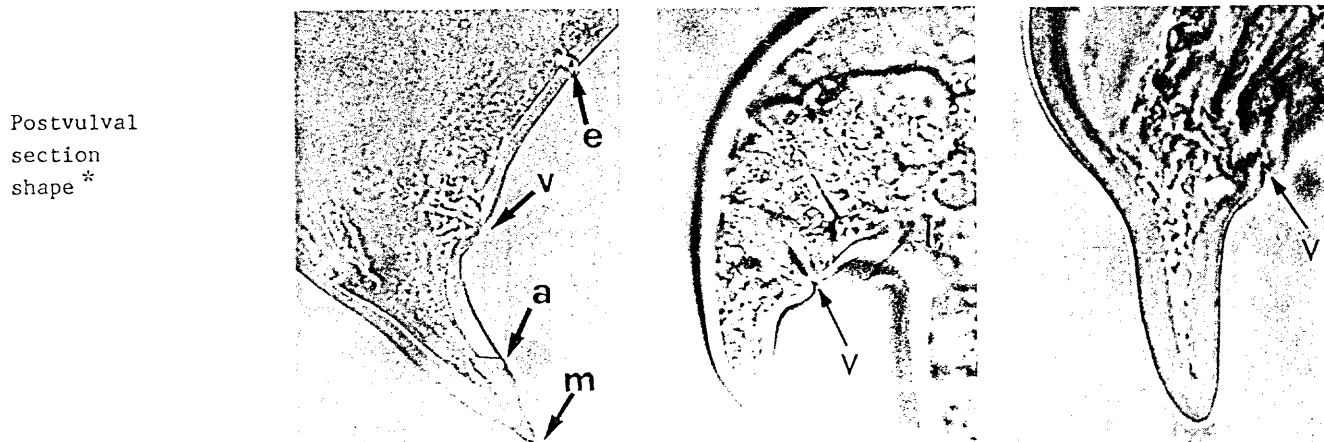
Major Identification Characters

The most distinctive morphological characteristics which distinguish T. graminis and T. palustris mature adult females, adult males, and J2 females from each other and also from those of T. semipenetrans are described as follows:

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Diagnostic characters of the 3 Florida species of Tylenchulus
Mature adult females

Differential morphological characters	<u>T. graminis</u>		<u>T. palustris</u>		<u>T. semipenetrans</u>	
	Range	Mean	Range	Mean	Range	Mean
Body shape						
					After Vilardebo & Luc 1961 (7).	
Body shape expressed as % of total body length that is swollen	66.0-85.1	72.7	32.3-53.8	40.0	34.4-60.0	47.4
Cuticle thickness	1.0-4.0	2.1	2.5-4.4	3.5	2.9-5.65	3.7



Postvulval section cavity (PVSC)	5.1-11.2	7.5	5.1-12.2	7.1	1.8-7.1	4.3
Postvulval section length (PVSL)	34.6-45.9	40.1	20.4-33.6	27.5	26.5-52.0	40.0
Postvulval section width (PVSW)	12.2-14.2	12.9	11.2-17.3	14.0	9.1-13.2	10.9
Rectum and anus	Perceptible		Imperceptible		Imperceptible	

* e = excretory pore, v = vulva, a = anus, m = mucro

Remarks: The PVSC and PVSL values of T. palustris and T. semipenetrans can overlap. If only a few specimens with overlapping values of these parameters are available, the morphological characters of adult males are needed for confirmation.

Adult males

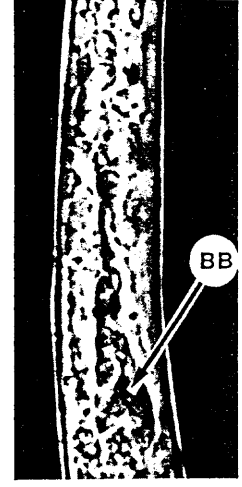
Differential
morphological
characters

T. graminis
Range Mean

T. palustris
Range Mean

T. semipenetrans
Range Mean

Basal bulb
(BB) size



Basal bulb width

8.1-12.2 9.2

8.1-11.2 9.1

5.1-8.0 6.4

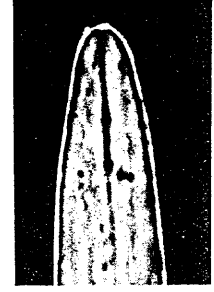
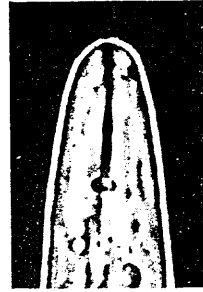
Body width

13.2-16.2 14.6

12.2-14.2 13.3

10.2-12.2 11.2

Stylet size



Stylet knob width

1.6-2.1 2.0

1.7-2.1 1.9

0.9-1.2 1.0

Tail shape



Tail length

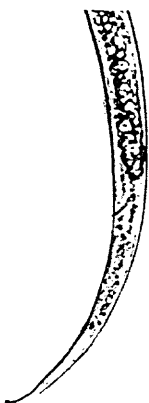


48.9-65.2 55.6

33.6-43.8 37.1

34.6-44.8 39.9

Remarks: Tail length of T. semipenetrans adult males varies among populations and usually it is less than 45 μm long (2,5), but males with tails longer than 45 μm have been observed in some populations from Florida. Populations of T. graminis with adult males having tails shorter than 45 μm may also occur in Florida. When specimens with these variable values are present, species identification should be based on the stylet knob and basal bulb or body width. Body width may vary in some populations of both T. graminis and T. semipenetrans and we have observed about 50 and 20% respectively, with adult male bodies 12 μm wide.

Second stage juveniles

Differential morphological characters	<u>T. graminis</u>		<u>T. palustris</u>		<u>T. semipenetrans</u>	
	Range	Mean	Range	Mean	Range	Mean
Posterior body section without large fat globules ($> 2 \mu\text{m}$)						
Length of the posterior body section without large fat globules	58.1-76.6	69.6	28.5-59.1	49.8	48.9-60.1	55.3
Rectum and anus	Discernable		Discernable occasionally		Imperceptible	
Tail length (from anus to body posterior end)	59.1-72.4	65.0	Cannot be calculated			
Genital primordium excretory pore distance	22.4-43.8	33.5	2.0-25.5	12.8	6.1-24.4	16.5

Remarks: The distance between the genital primordium and excretory pore can be easily measured in specimens stained with acid fuchsin in lactoglycerol. Recent observations on T. graminis and T. semipenetrans populations from Florida have indicated that J2 with genital primordium excretory pore distance ranging from 22 to 28 μm are frequent in both species; however, the values of this character are always greater than 20 μm in T. graminis, while they are usually less than 20 μm in T. semipenetrans. Rectum and anus can be observed in T. graminis J2 only at high magnification under oil immersion, on live specimens. Rectum and anus have recently been observed in some specimens of T. palustris J2 and they were located about 50 μm from the tail terminus. T. palustris and T. semipenetrans J2 are indistinguishable.

LITERATURE CITED:

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